

Section 4.2 p.119 Synthesis and Decomposition Reactions

Practice Problems p. 122

10. a) $2 \text{K} + \text{Br}_2 \rightarrow 2 \text{KBr}$
b) $\text{H}_2 + \text{Cl}_2 \rightarrow 2 \text{HCl}$
c) $\text{Ca} + \text{Cl}_2 \rightarrow \text{CaCl}_2$
d) $4 \text{Li} + \text{O}_2 \rightarrow 2 \text{Li}_2\text{O}$
11. a) Fe has 2 oxidation states: 2,3
 $4 \text{Fe} + 3 \text{O}_2 \rightarrow 2 \text{Fe}_2\text{O}_3$
 $2 \text{Fe} + \text{O}_2 \rightarrow 2 \text{FeO}$
b) V has 4 oxidation states: 2,3,4,5
 $2 \text{V} + \text{O}_2 \rightarrow 2 \text{VO}$
 $4 \text{V} + 3 \text{O}_2 \rightarrow 2 \text{V}_2\text{O}_3$
 $\text{V} + \text{O}_2 \rightarrow \text{VO}_2$
 $4 \text{V} + 5 \text{O}_2 \rightarrow 2 \text{V}_2\text{O}_5$
c) Co has two oxidation states: 2,3
 $\text{Co} + \text{Cl}_2 \rightarrow 2 \text{CoCl}$
 $2 \text{Co} + 3 \text{Cl}_2 \rightarrow 2 \text{CoCl}_3$
d) Ti has three oxidation states: 2,3,4
 $2 \text{Ti} + \text{O}_2 \rightarrow 2 \text{TiO}$
 $4 \text{Ti} + 3 \text{O}_2 \rightarrow 2 \text{Ti}_2\text{O}_3$
 $\text{Ti} + \text{O}_2 \rightarrow \text{TiO}_2$
12. a) $\text{K}_2\text{O} + \text{H}_2\text{O} \rightarrow 2 \text{KOH}$
b) $\text{MgO} + \text{H}_2\text{O} \rightarrow \text{Mg}(\text{OH})_2$
c) $2 \text{NO}_2 + \text{H}_2\text{O} \rightarrow \text{HNO}_3 + \text{HNO}_2$ (both acids are produced)
d) $\text{SO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_3$

In both (a) and (b) you have a metal oxide reacting with water and that will produce a base, a metal hydroxide. In both (c) and (d) you have a non-metal oxide reacting with water and that will produce an acid. In (c) you would have to know that both nitric and nitrous acid are produced, or you would not be able to balance the equation. In (d) you would have to use sulfurous acid as the product in order to balance the equation.

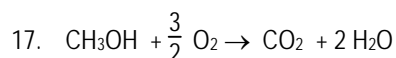


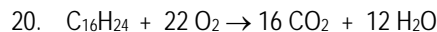
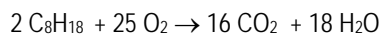
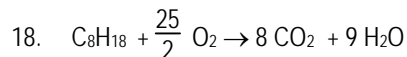
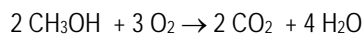
Practice Problems p. 123

14. $2 \text{HgO} \rightarrow 2 \text{Hg} + \text{O}_2$
15. a) $2 \text{HI} \rightarrow \text{H}_2 + \text{I}_2$
b) $2 \text{Ag}_2\text{O} \rightarrow 4 \text{Ag} + \text{O}_2$
c) $2 \text{AlCl}_3 \rightarrow 2 \text{Al} + 3 \text{Cl}_2$
d) $2 \text{MgO} \rightarrow 2 \text{Mg} + \text{O}_2$
16. a) $\text{MgCO}_3 \rightarrow \text{MgO} + \text{CO}_2$
b) $\text{CuCO}_3 \rightarrow \text{CuO} + \text{CO}_2$

Practice Problems p. 124

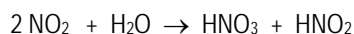
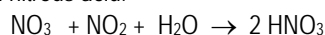
The products of complete combustion are always carbon dioxide and water. To balance these equations, balance the C first, then the H. After that, you often need to use a fraction in front of the O_2 . Then clear the fraction.



**Section Review p. 125**

1. a) $2 \text{Be} + \text{O}_2 \rightarrow 2 \text{BeO}$ b) $2 \text{Li} + \text{Cl}_2 \rightarrow 2 \text{LiCl}$
 c) $3 \text{Mg} + \text{N}_2 \rightarrow \text{Mg}_3\text{N}_2$ d) $2 \text{Al} + 3 \text{Br}_2 \rightarrow 2 \text{AlBr}_3$
 e) $4 \text{K} + \text{O}_2 \rightarrow 2 \text{K}_2\text{O}$
2. a) $2 \text{K}_2\text{O} \rightarrow 4 \text{K} + \text{O}_2$ b) $2 \text{CuO} \rightarrow 2 \text{Cu} + \text{O}_2$
 c) $2 \text{H}_2\text{O} \rightarrow 2 \text{H}_2 + \text{O}_2$ d) $2 \text{Ni}_2\text{O}_3 \rightarrow 4 \text{Ni} + 3 \text{O}_2$
 e) $2 \text{Ag}_2\text{O} \rightarrow 4 \text{Ag} + \text{O}_2$
3. a) $\text{Sn}(\text{OH})_4 \rightarrow \text{SnO}_2 + 2 \text{H}_2\text{O}$ decomposition
 b) $3 \text{Cl}_2 + \text{I}_2 \rightarrow 2 \text{ICl}_3$ synthesis
4. $\text{C}_4\text{H}_9\text{OH} + 6 \text{O}_2 \rightarrow 4 \text{CO}_2 + 5 \text{H}_2\text{O}$
5. $2 \text{HgO} \rightarrow 2 \text{Hg} + \text{O}_2$

6. Nitrates (NO_3) and nitrites (NO_2) are both non-metal oxides. Therefore, when they combine with water droplets in the air, they will form nitric and nitrous acid:



The formation on nitrous and nitric acid from nitrates and nitrites does not take place in one step, so the overall reaction is very tricky to get. You should always know the products, and then balance the equation, but here you have to use balancing the equation to get the product.